**What is claimed is:**

1. A glow plug energization control apparatus for controlling energization from a battery to a glow plug having a resistance heater installed in an engine when a key switch is put in an on position or a start position, the glow plug energization control apparatus comprising:

a pre-glow unit for controlling the energization to the glow plug to quickly raise temperature of the resistance heater when the key switch is put in the on position;

an upkeep glow unit for calculating a duty ratio Dh of a voltage waveform applied to the glow plug on the basis of a voltage value applied to the glow plug from the battery subsequently to the energization control performed by the pre-glow unit and for performing PWM control for the energization to the glow plug according to the duty ratio Dh;

a cranking glow unit for calculating, in a period of a cranking started by putting the key switch in the start position during the energization control performed by the upkeep glow unit, a duty ratio Dk of a voltage waveform applied to the glow plug on the basis of a voltage value applied to the glow plug from the battery and for performing PWM control for the energization to the glow plug according to the duty ratio Dk larger than a virtual

duty ratio Dhh calculated by the upkeep glow unit when it is assumed that the voltage value of the battery in a control period of the upkeep glow unit is equal to the voltage value of the battery in a control period of the cranking glow unit; and

an after starting glow unit for, after the engine is started, supplying an electric power, which is lower than an electric power supplied to the glow plug by the pre-glow unit, to the glow plug to realize stable heating of the resistance heater.

2. A glow plug energization control apparatus according to claim 1, wherein the pre-glow unit controls the energization to the glow plug until an accumulated wattage applied to the glow plug becomes a predetermined value corresponding to the first target temperature.

3. A glow plug energization control apparatus according to claim 1, wherein the pre-glow unit continuously performs the energization to the glow plug during the control period.

4. A glow plug energization control apparatus according to claim 1, wherein when the key switch is not put in the start position in a predetermined time from

the start of the energization control performed by the upkeep glow unit, the upkeep glow unit stops the energization to the glow plug.

5. A glow plug energization control apparatus according to claim 1, wherein the after starting glow unit controls the energization to the glow plug to make the temperature of the resistance heater a second target temperature and to keep this.

6. A glow plug energization control apparatus according to claim 5, wherein the after starting glow unit calculates a duty ratio Da of the voltage waveform applied to the glow plug on the basis of a resistance value of the resistance heater, and performs PWM control for the energization to the glow plug according to the duty ratio Da.

7. A glow plug energization control apparatus according to claim 1, further comprising a pre-glow priority unit which, when the key switch is put in the start position during the energization control performed by the pre-glow unit, waits for ending of the energization control performed by the pre-glow unit and

shifts it to energization control performed by the cranking glow unit.

8. A glow plug energization control method for controlling energization from a battery to a glow plug having a resistance heater installed in an engine when a key switch is put in an on position or a start position, the glow plug energization control method comprising:

a pre-glow step of controlling the energization to the glow plug to quickly raise temperature of the resistance heater when the key switch is put in the on position;

a upkeep glow step of calculating a duty ratio Dh of a voltage waveform applied to the glow plug on the basis of a voltage value applied to the glow plug from the battery subsequently to the pre-glow step and for performing PWM control for the energization to the glow plug according to the duty ratio Dh;

a cranking glow step of calculating, in a period of a cranking started by putting the key switch in the start position in the upkeep glow step, a duty ratio Dk of a voltage waveform applied to the glow plug on the basis of a voltage value applied to the glow plug from the battery and performing PWM control for the energization to the glow plug according to the duty ratio Dk larger than a

virtual duty ratio Dhh calculated in the upkeep glow step when it is assumed that the voltage value of the battery in the upkeep glow step is equal to the voltage value of the battery in the cranking glow step; and

an after starting glow step of supplying, after the engine is started, an electric power, which is lower than an electric power supplied to the glow plug in the pre-glow step, to the glow plug to realize stable heating of the resistance heater.

9. A glow plug energization control method according to claim 8, wherein at the pre-glow step, the energization to the glow plug is controlled until an accumulated wattage to the glow plug becomes a predetermined value corresponding to a first target temperature.

10. A glow plug energization control method according to claim 8, wherein at the pre-glow step, continuous energization to the glow plug is performed.

11. A glow plug energization control method according to claim 8, wherein at the upkeep glow step, when the key switch is not put in the start position in a

predetermined time from the start of the upkeep glow step, the energization to the glow plug is stopped.

12. A glow plug energization control method according to claim 8, wherein at the after starting glow step, the energization to the glow plug is controlled to make the temperature of the resistance heater a second target temperature and to keep this.

13. A glow plug energization control method according to claim 12, wherein at the after starting glow step, a duty ratio Da of the voltage waveform applied to the glow plug is calculated on the basis of a resistance value of the resistance heater, and PWM control for the energization to the glow plug is performed according to the duty ratio Da.

14. A glow plug energization control method according to claim 8, wherein, when the key switch is put in the start position in the pre-glow step, after the pre-glow step has been ended, it is shifted to the cranking glow step.